Architectural Challenges and Solutions

Connecting Related Records and Documents by

Developing New Approaches Complementary with

Heritage IT Infrastructure Capabilities

John Cameron

Pratt & Whitney Rocketdyne

Introduction

- **Pursued defining relationships between IT database records**

  - Over last ~ 15 years

  - Spanning engineering, manufacturing, quality, and procurement

- **Integrated IT architecture can be leveraged**

  - To enhance search/data mining capabilities

  - Knowledge put to use on new designs, design modifications, failure investigations, non-conformance investigations, other areas of interest

- **Discussion focuses on "connect" concept and implementation**

  - Enable user to retrieve records/documents related to a task or an issue
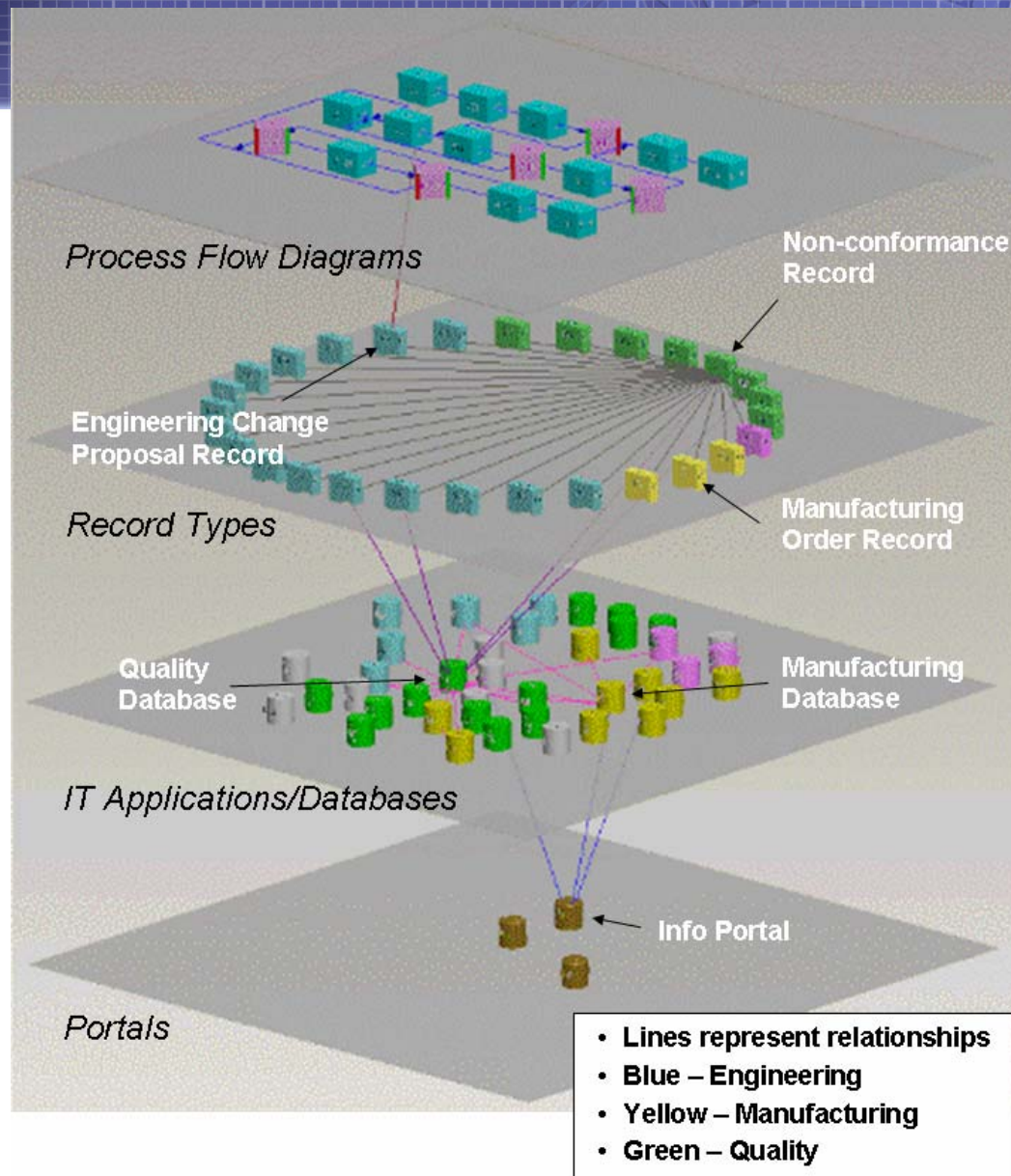
Problem Statement

- **Process for retrieving related records and documents**

  - Tedious, time consuming, and inaccurate

- **Records reside in multiple IT databases**

  - Engineering, manufacturing, non-conformance, and procurement

- **Documents reside in isolated share drives and folders**

  - Powerpoint, Word, Excel, pdf, etc.

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"Connect" Objectives and Approach

- **Objectives**

  - Reduce retrieval cycle time for related information

  - Improve accuracy in retrieving relevant, related information

- **Approach**

  - User proactively assigns records and documents relationships

Historical Trend In Defining Relationships

- **A "connect" capability completes historical trend**
  - **Managing results**
    - Records stored in IT databases
    - Documents stored in local and share drives/folders
  - **Managing interactions**
    - Electronic links between IT applications
      - Links defined by process/business rules
      - Typically links defined at data element level, not record level
  - **Managing relationships**
    - Automated product assurance pedigree
      - Serial number key attribute in connecting records
    - **Connecting records and documents**
      - **Connection to a task being worked or an issue being investigated**
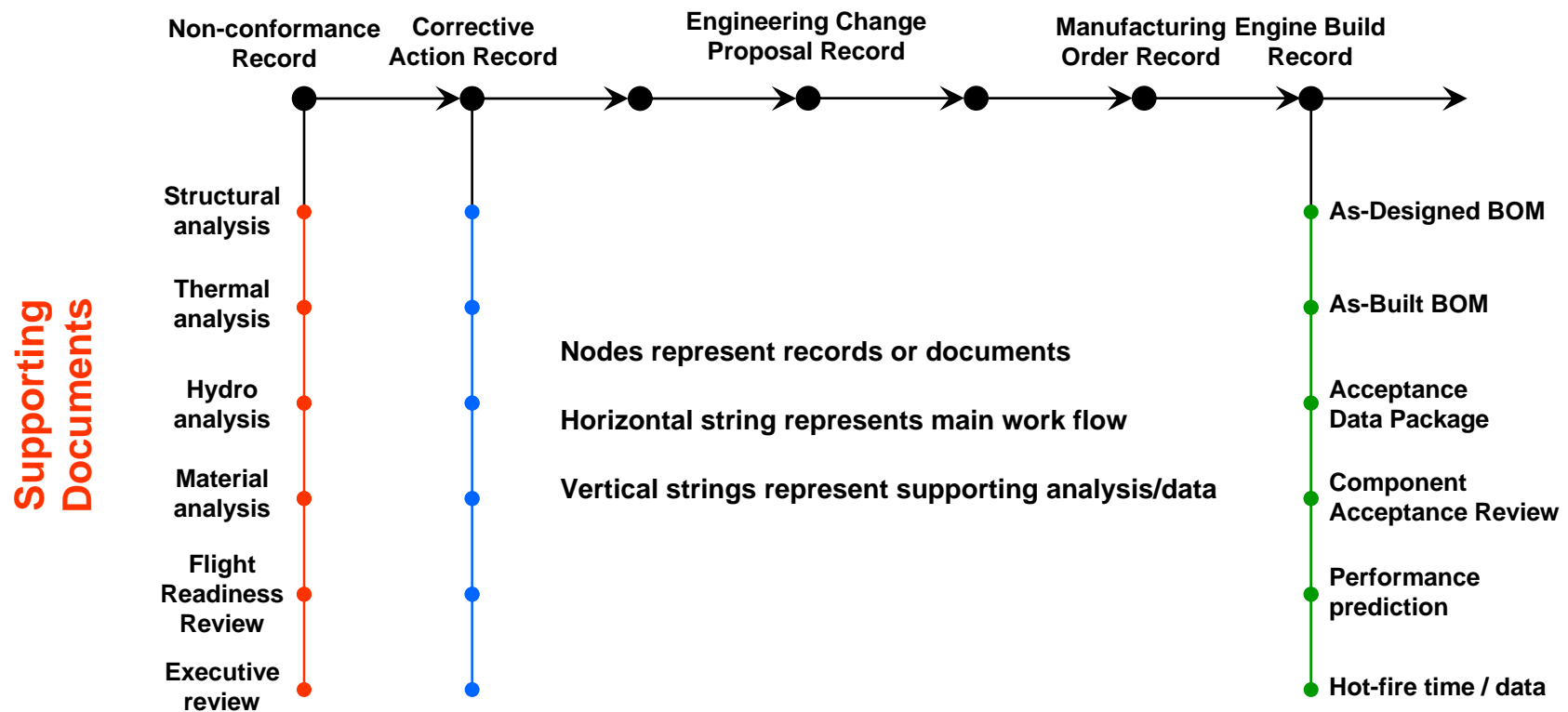
Target State

- **Minimize**

  - Number of steps to "connect"

  - Number of "clicks" to view information

- **Eliminate need to toggle**

  - Between IT applications and share drives/folders
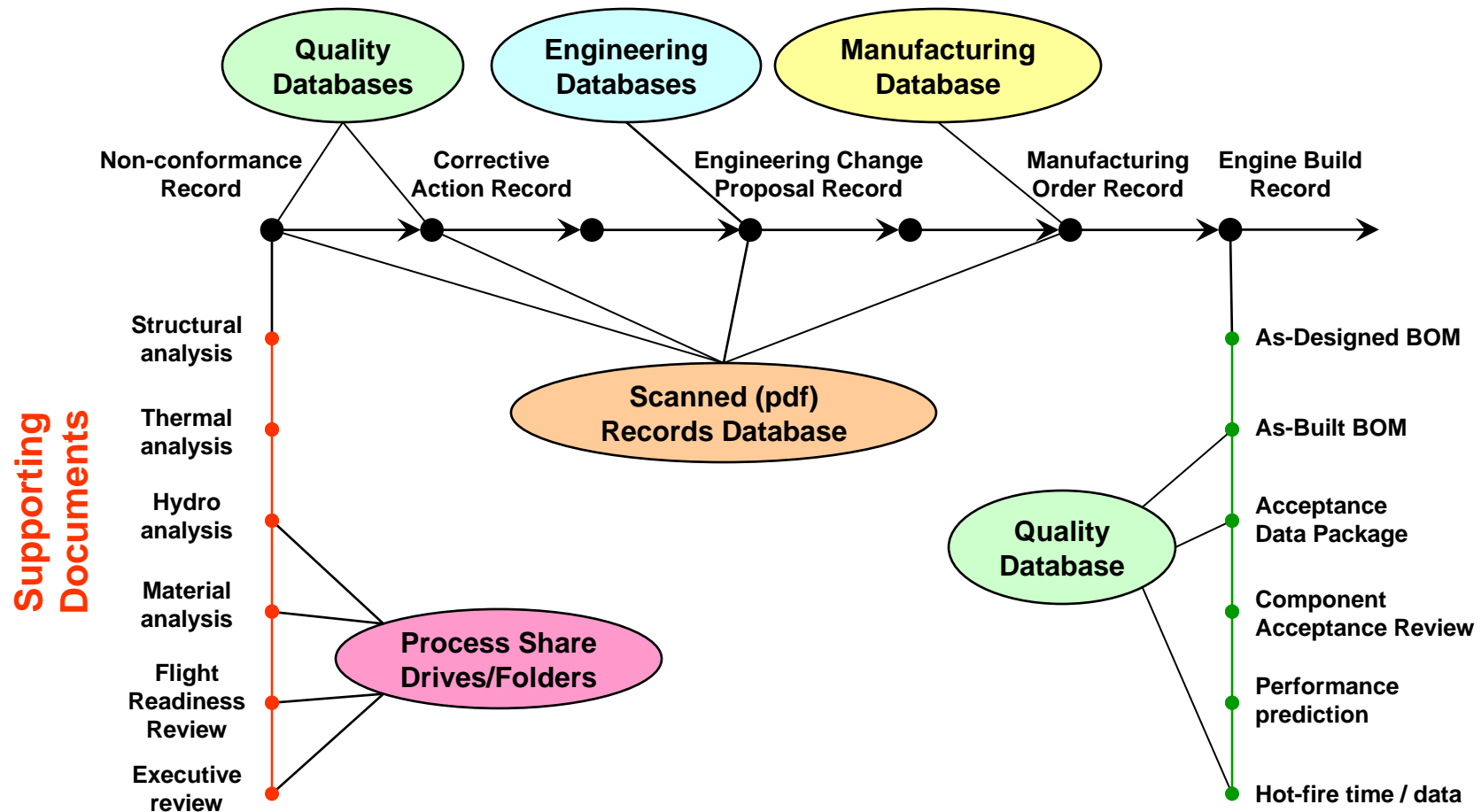
Relationships between Records and Documents Example

Records

Non-conformance Record
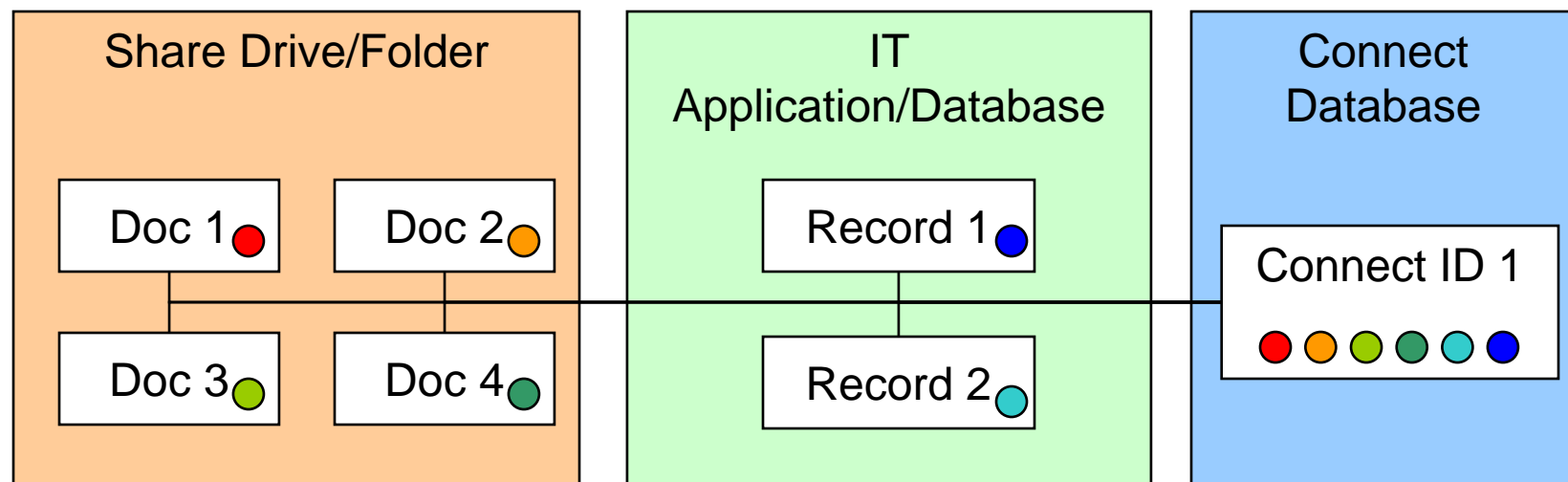
Corrective Action Record

Engineering Change Proposal Record

Manufacturing Order Record

Engine Build Record

Supporting Documents

Structural analysis

Thermal analysis

Hydro analysis

Material analysis

Flight Readiness Review

Executive review

Nodes represent records or documents

Horizontal string represents main work flow

Vertical strings represent supporting analysis/data

As-Designed BOM

As-Built BOM

Acceptance Data Package

Component Acceptance Review

Performance prediction

Hot-fire time / data

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Records

Quality Databases

Engineering Databases

Manufacturing Database

Non-conformance Record

Corrective Action Record

Engineering Change Proposal Record

Manufacturing Order Record

Engine Build Record

Scanned (pdf) Records Database

Supporting Documents

Structural analysis

Thermal analysis

Hydro analysis

Material analysis

Flight Readiness Review

Executive review

Process Share Drives/Folders

Quality Database

As-Designed BOM

As-Built BOM

Acceptance Data Package

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"Connect" Tool Requirements

- **Making the connection**
  - Hyperlink records/documents to Connect ID
  - Cross referencing between Connect ID and records/documents
  - Connecting the Connect IDs (connection tree)
  - Unique Connect identifier
  - Add / delete Connect IDs
  - Add / delete records and documents
  - Alert when link broken

- **System**
  - Security protocol

Cross Referencing

- **Dots represent marker tying records and documents to Connect ID**

Connecting The Connect IDs

Doc 1	Doc 2	Doc 3

Connect ID 1

Record 1	Record 2	Record 3

Doc 4	Doc 2	Doc 3

Connect ID 2 — Connect ID 4 → Download

Record 4	Record 5	Record 3

Doc 1	Doc 5	Doc 6

Connect ID 3 → Download

Record 4	Record 6	Record 7
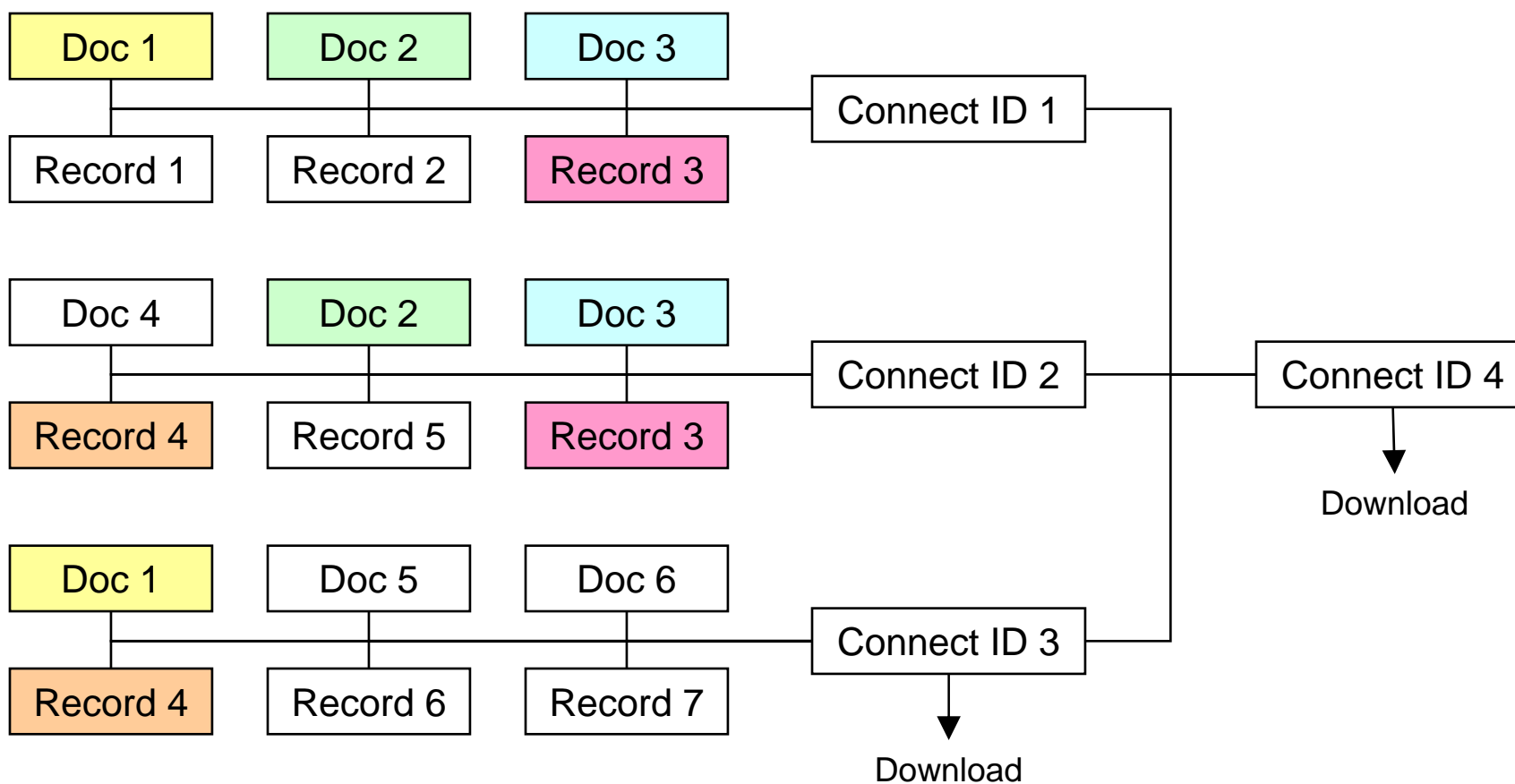
"Connect" Process Requirements

- **Establish process requirements**

    - Document identity/metatag control

    - Connect ID and records/documents metatag consistency

        - Title and key codes/words

    - Use Connect Tool to hyperlink records and documents to Connect ID

- **Periodically audit to ensure compliance**

- **Started with Quality legacy information**
  - Request submitted to improve search capability

Non-conformance Records
- Record 1
- Record 2
- Record 3
- Record 4
- Record 5

Metadata Repositories (Applications/Databases)
- Contains record's content
- Quality Database
- Quality Database

- Metatag relationships
- Queries
- Reports

Data Mart

Case File Management

- *Hyperlink* to records

Graphic User Interface
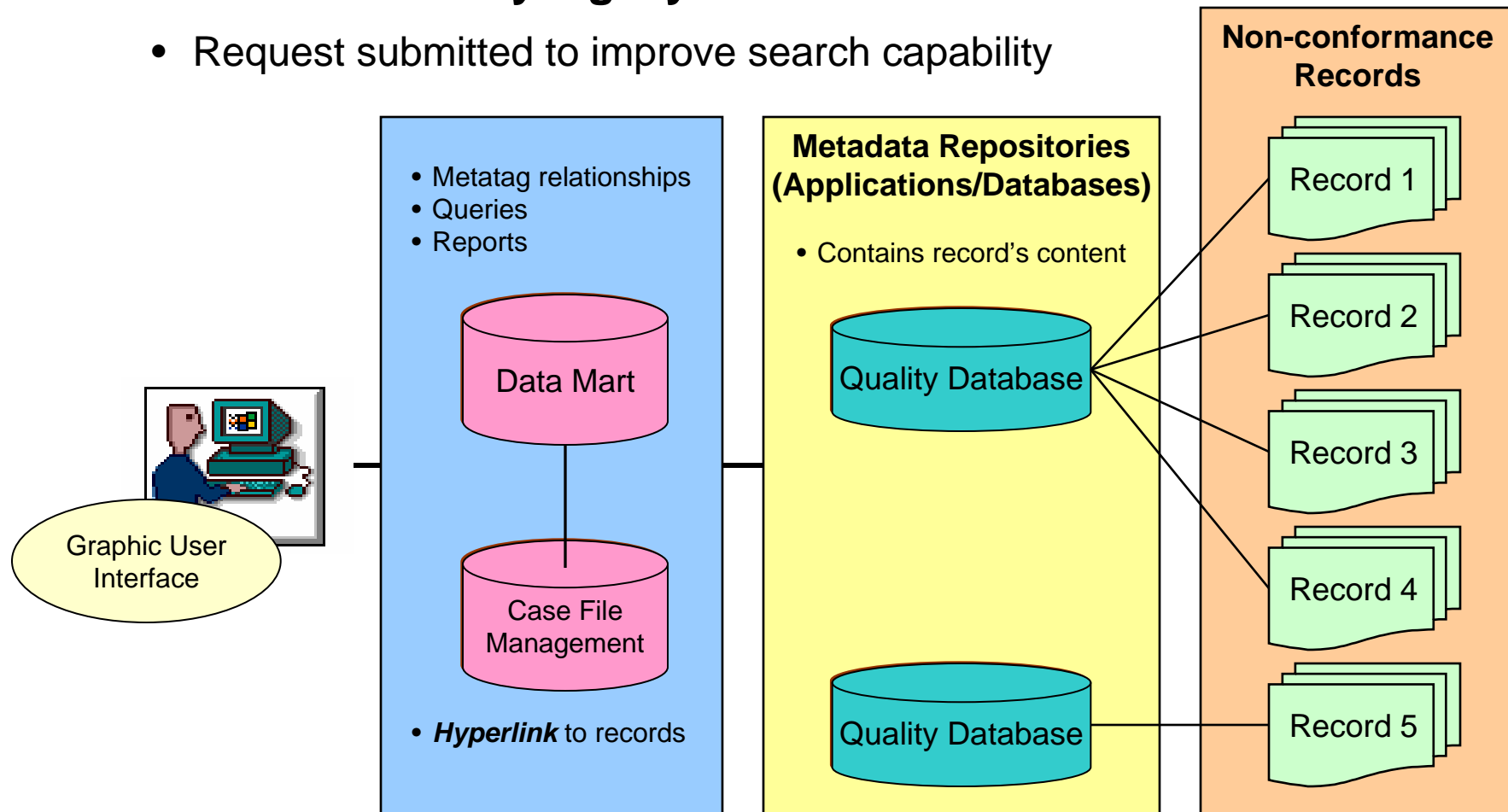
Problem Reporting Analysis Tool (PRAT) Development

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Case File

| Engineering Databases | → | Record 1 / Record 2 | Record 3 / Record 4 | Record 5 |

| Manufacturing Databases | → | Record 6 / Record 7 |

| Quality Databases | → | Record 8 / Record 9 | Record 10 / Record 11 | Record 12 |

| Procurement Databases | → | Record 13 / Record 14 |

| Share Drives/Folders | → | Document 1 / Document 2 | Document 3 / Document 4 |

- **Search engine**
  - Filter by
    - Program
    - Record type
    - Hardware family/component
    - Key words
  - Custom thesaurus

Generalized Search Paths

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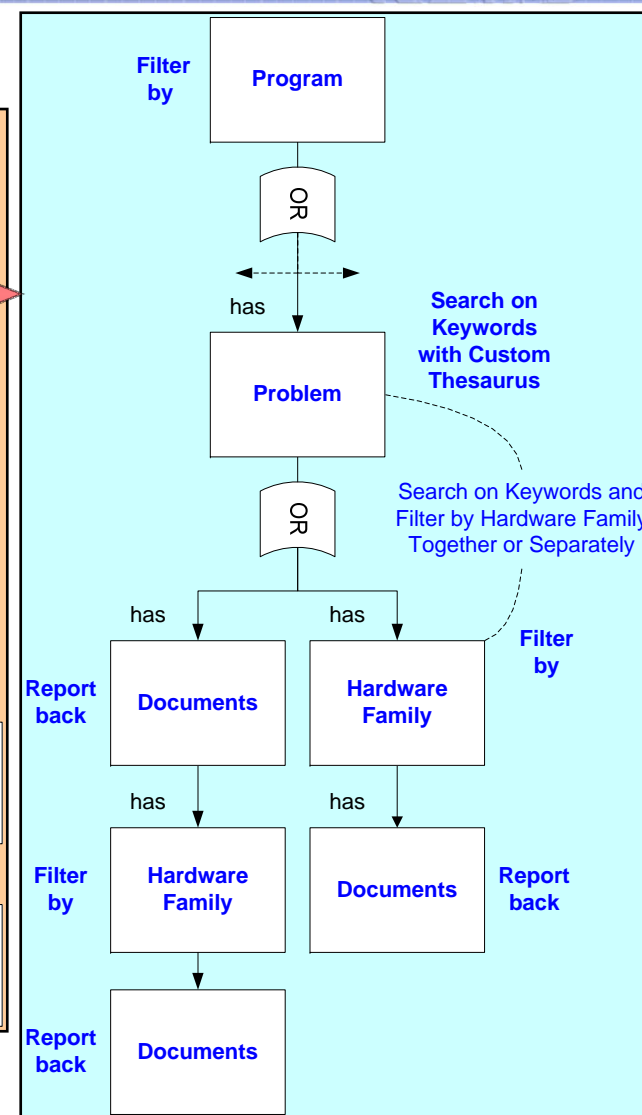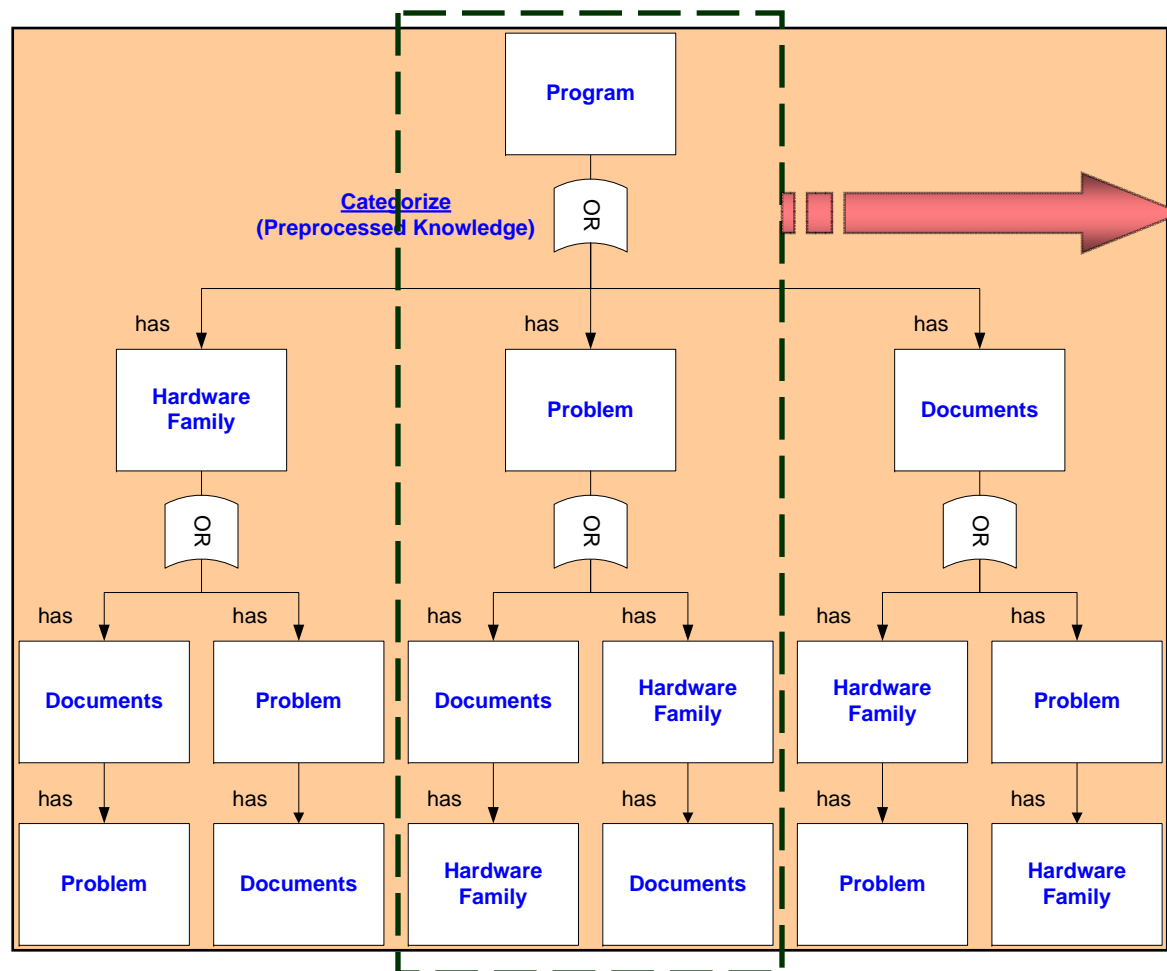
"Connect" Design For Engine's Records and Documents

Conceptual Design R and D	Design R and D	Fabrication R and D	Assembly R and D	Test R and D	Flight R and D	Deliverable R and D
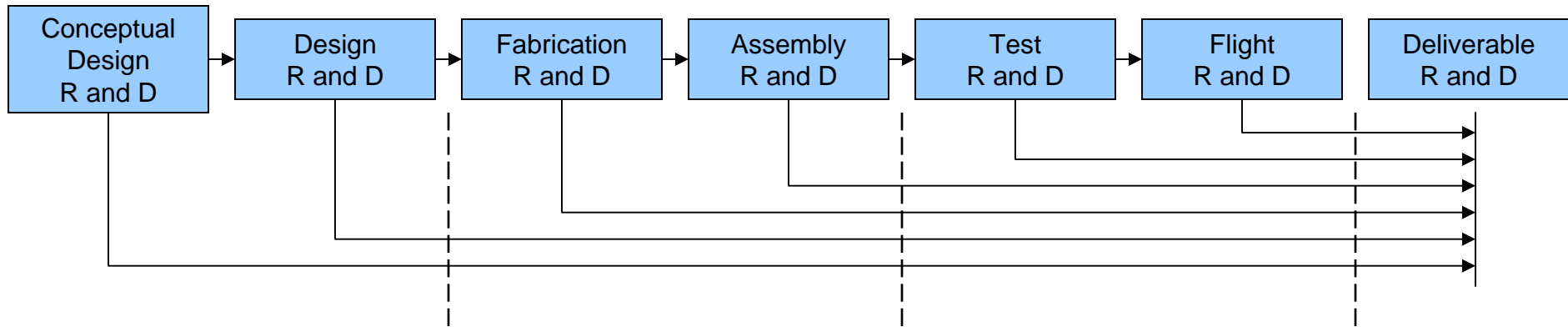
- **Establish engines' connection design or layout up front**

  - Pull together records and documents by pre-determined categories

    - Use Connect Tool to pull together

  - Focus on ease of retrieval and comprehension of connection layout

Create	Store	Retrieve	Deliver
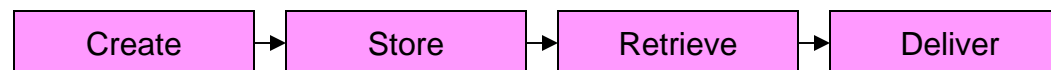
Conclusion

- **Connect tool advantages**
  - Those who generate records and documents proactively "connects" them
  - Allows for "structured" searches
    - Cross referencing and connecting the connect IDs features
    - Less need for every related record and document to have same keys
  - "Connect" concept can be expanded
    - Enable gathering of relevant "paper" generated on hardware assembly
    - Could download to CD
      - Deliver CD with hardware assembly to customer

- **Challenges**
  - Maintaining connections
    - Documents may be moved to another share drive or folder
    - Records/Documents may be archived at the end of a Program
    - Applications/databases may become obsolete

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- **Phased development important**

  - Competition for scarce funds

  - Story board or tool prototype better than submitting software requirement document at end of funding period

    - Quicker way to obtain user feedback to gauge community receptiveness

- **Good IT lead analyst essential**

  - Have analyst write requirement document

    - Monitor time analyst spends on writing it

  - Presents in plain English available solutions

Back up slides

PRAT Story Board

PRAT Story Board

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PRAT Story Board

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